

Appendix 5-4

Coal Pillar Safety Factor Calculations

COAL PILLAR SAFETY FACTORS

Methods used to calculate coal pillar safety factors appear in Appendix 12-1. Average uniaxial compressive strength (C_p) and overburden pressure gradient (S_v) values used in section 12.3.2 are used in calculation of right-of-way safety factors.

EQUATIONS:

$$\text{Pillar Strength } (C_p): C_p = C (.778 + .222 (W/H))$$

C = Coal Uniaxial Compressive Strength
 W = Width of Pillar
 H = Height of Pillar

$$\text{Recovery Factor } (R): R = A_0/A_t$$

A_0 = Area of Entry
 A_t = Total Area

$$\text{Safety Factor } (F.S.): F.S. = C_p (1-R)/S_v$$

S_v = Vertical Stress = 1 psi/foot of overburden

CALCULATIONS:

Eastern end of the right-of-way (area with smallest pillar height):

Criteria: H = 5 feet
 S_v = 1650 psi
 C = 2200 psi
 W = 60 feet
Pillar length = 140 feet
Pillar centers = 80 and 160 feet

$$C_p = 2200(.778 + .222(60/5)) = 7572 \text{ psi}$$

$$R = 20(80+140)/80 \times 160 = .34$$

$$F.S. = 7572(1-.34)/1650 = 3.03$$

Western end of the right-of-way (area with greatest pillar height):

Criteria: H = 9.6 feet
 S_v = 1700 psi
 C = 2200 psi
 W = 60 feet
 Pillar length = 140 feet
 Pillar centers = 80 and 160 feet

$$C_p = 2200(.778 + .222(60/9.6)) = 4764 \text{ psi}$$

$$R = 20(80+140)/80 \times 160 = .34$$

$$F.S. = 4764(1-.34)/1700 = 1.85$$

Average right-of-way pillar height and overburden:

Criteria: H = 7.16 feet
 S_v = 1500 psi
 C = 2200 psi
 W = 60 feet
 Pillar length = 140 feet
 Pillar centers = 80 and 160 feet

$$C_p = 2200(.778 + .222(60/7.16)) = 5804 \text{ psi}$$

$$R = 20(80+140)/80 \times 160 = .34$$

$$F.S. = 5804(1-.34)/1500 = 2.55$$